NASA STTR 2016 Phase I Solicitation

T13   Ground and Launch Systems Processing

Ground and Launch Systems Processing. The goal of this topic is to provide a flexible and sustainable US capability for ground processing as well as launch, mission, and recovery operations to significantly increase safe access to space. The Ground and Launch Systems Processing topic consists of four technology subareas, including: technologies to optimize the operational life-cycle, environmental and green technologies, technologies to increase reliability and mission availability, and technologies to improve mission safety/mission risk. The primary benefit derived from advances in this technology area is reduced cost, freeing funds for other investments.

Subtopics

T13.01 Embedded Intelligent Sensor Systems

Lead Center: SSC

Participating Center(s): KSC, MSFC

This subtopic area seeks to develop advanced instrumentation technologies which can be embedded in systems and subsystems. Embedded sensor systems have the potential for substantial reduction in time and cost of propulsion systems development, with substantially reduced operational costs and evolutionary improvements in ground, launch and flight system operational robustness. The technologies developed would be capable of addressing multiple mission requirements for remote monitoring such as vehicle health monitoring. The goal is to provide a highly flexible instrumentation solution capable of monitoring remote or inaccessible measurement locations. All this while eliminating cabling and auxiliary power.

Rocket propulsion test facilities within NASA provide excellent test beds for testing and using the innovative technologies discussed above. Rocket propulsion development is enabled by rigorous ground testing to mitigate the propulsion system risks that are inherent in spaceflight. Test articles and facilities are highly instrumented to enable a comprehensive analysis of propulsion system performance.

This primary emphasis is to develop near-term products that augment and enhance proven, state-of-the-art propulsion test facilities. But the ultimate goal is develop sensor technologies capable of being embedded in structures and systems that are smaller, more energy efficient allowing for more complete and accurate vehicle health assessments. Development of a range of self-powered devices that maximize the safety and reliability of extended missions will enhance human space flight capabilities in support of human and robotic exploration missions. It is anticipated these sensor system will achieve orders of magnitude reduction in mass and size in the future.

Specific technology needs include the following:

- Sensor systems should provide an advanced diagnostics capability to monitor test facility parameters including simultaneous heat flux, temperature, pressure, strain and near-field acoustics.
- Applications encompass remote monitoring of vacuum lines, gas leaks and fire; where the use of wireless/self-powered sensors to eliminate power and data wires would be beneficial.
- Sensor systems should have the ability to provide the following functionality:
    - Measurement.
    - Measure of the quality of the measurement.
    - Measure of the "health" of the sensor.

- Sensor systems should enable the ability to detect anomalies, determine causes and effects, predict future anomalies, and provides an integrated awareness of the health of the system to users (operators, customers, management, etc.).
- Sensors are needed with capability to function reliably in extreme environments. Collected data must be time stamped to facilitate analysis with other collected data sets.
- Sensor systems should be self-contained to collect information and relay measurements through various means by a sensor-web approach to provide a self-healing, auto-configuring method of collecting data from multiple sensors, and relaying for integration with other acquired data sets.
- The proposed innovative systems must lead to improved safety and reduced test costs by allowing real-time analysis of data, information, and knowledge through efficient interfaces to enable integrated awareness of the system condition by users.